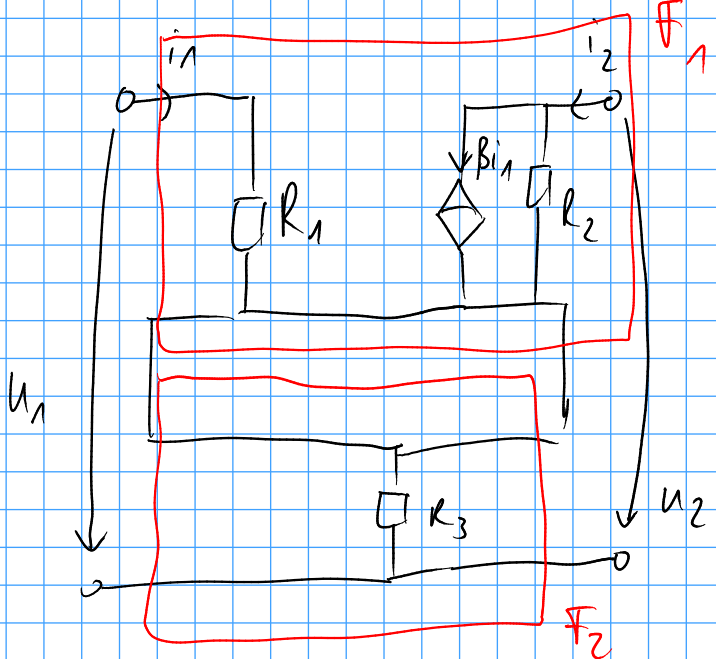
ST 1 - Tutorium - Blatt 6

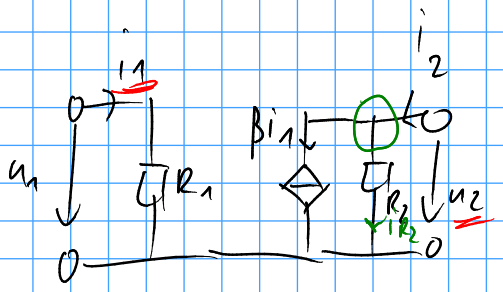


F_1 → in Reihe verschaltet

→ $R_{F_1} = R_{F_{1,1}} + R_{F_2}$

1. Hybrid
   - Reihen-Parallel $\quad \underset{\sim}{H}_{qps} = \underset{\sim}{H}_1 + \underset{\sim}{H}_2$
   - Parallel-Reihe $\quad \underset{\sim}{H}'_{qps} = \underset{\sim}{H}'_1 + \underset{\sim}{H}'_2$

2.



KCL: $-i_2 + \beta i_1 + i_{R_2} = 0$

$i_{R_2} = i_2 - \beta i_1 \overset{i_2=0}{=} -\beta i_1$

$u_2 = R_2 i_{R_2} \overset{i_2=0}{=} -R_2 \beta i_1$

$\Rightarrow R_{F_1} = \begin{pmatrix} R_1 & 0 \\ -R_2\beta & R_2 \end{pmatrix}$

LL/KS-Methode:

$\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} = \begin{pmatrix} r_{11} & r_{12} \\ r_{21} & r_{22} \end{pmatrix} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix}$

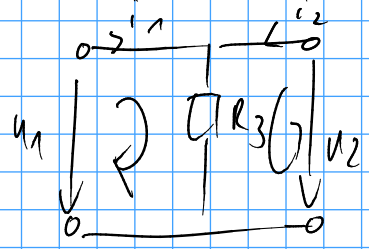
$r_{11} = \left.\frac{u_1}{i_1}\right|_{i_2=0} = R_1$

$r_{12} = \left.\frac{u_1}{i_2}\right|_{i_1=0} = 0$

$r_{21} = \left.\frac{u_2}{i_1}\right|_{i_2=0} = -R_2\beta$

$r_{22} = \left.\frac{u_2}{i_2}\right|_{i_1=0} = R_2$

F_2:



$$\underset{\sim}{R}_{F_2} = \begin{pmatrix} R_3 & R_3 \\ R_3 & R_3 \end{pmatrix}$$

$$\underset{\sim}{R}_{ges} = \underset{\sim}{R}_1 + \underset{\sim}{R}_2 = \begin{pmatrix} R_1+R_3 & R_3 \\ -R_2\beta+R_3 & R_2+R_3 \end{pmatrix}$$

4. Kettenverschaltung: Kettenmatrix notwendig

$$\underset{\sim}{H} = \begin{pmatrix} 1\,\Omega & -1 \\ 1 & 2S \end{pmatrix} \qquad \det \underset{\sim}{H} = 2+1 = 3$$

$$\underset{\sim}{A} = \frac{1}{h_{21}} \begin{pmatrix} -\det H & -h_{11} \\ -h_{22} & -1 \end{pmatrix} = \frac{1}{1} \begin{pmatrix} -3 & -1\,\Omega \\ -2S & -1 \end{pmatrix} = \begin{pmatrix} -3 & -1\,\Omega \\ -2S & -1 \end{pmatrix}$$

$$\underset{\sim}{A}_T = \frac{1}{r_{21}} \begin{pmatrix} r_{11} & \det R \\ 1 & r_{22} \end{pmatrix} \qquad \det \underset{\sim}{R} = R_1R_2 + R_1R_3 + R_2R_3(1+\beta)$$

$$\Rightarrow \underset{\sim}{A}_T = \frac{1}{-R_2\beta+R_3} \begin{pmatrix} R_1+R_3 & R_1R_2+R_1R_3+R_2R_3(1+\beta) \\ 1 & R_2+R_3 \end{pmatrix}$$

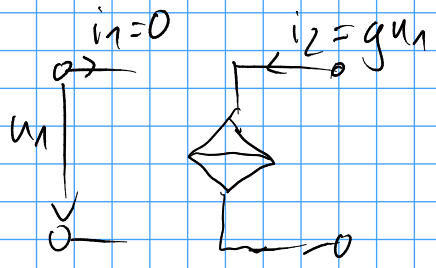
Multiplikation

$$\underset{\sim}{A}_{ges} = \underset{\sim}{A}_T \odot \underset{\sim}{A}_H = \frac{1}{-R_2\beta+R_3} \begin{pmatrix} -3(R_1+R_3)-2S(R_1R_2+R_1R_3+R_2R_3(1+\beta) & V_1 \\ -3-2S(R_2+R_3) & V_2 \end{pmatrix}$$

$$V_1 \quad -1\,\Omega(R_1+R_3) - 1(R_1R_2+R_1R_3+R_2R_3(1+\beta)$$

$$V_2 \quad -2S-(R_2+R_3)$$

Quiz



$$\begin{pmatrix} i_1 \\ i_2 \end{pmatrix} = G \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$

$$G = \begin{pmatrix} 0 & 0 \\ g & 0 \end{pmatrix}$$

$$\underset{\sim}{R} = \underset{\sim}{G}^{-1}$$

$$\det G = 0$$